REMARKS

Status of the claims:

With the above amendments, claims 5, 6, and 7 have been canceled and claims 10-16 have been added. Thus, claims 2, 3, 4, and 9-16 are pending and ready for further action on the merits.

Reconsideration is respectfully requested in light of the following remarks.

Rejections under 35 USC §103

Claims 3-7 have been rejected under 35 USC §103(a) as being unpatentable over JP '232 (Japanese Patent No. 10-110232) optionally in view of JP '054 (Japanese Patent 58-031054).

Claims 2 and 9 have been rejected under 35 USC §103(a) as being unpatentable over JP '232 in view of JP '054 and Komatsubara '948 (US Patent No. 4,718,948).

These rejections are traversed for the following reasons.

Claims 5-7 have been canceled so the rejection with respect to those claims is moot.

Patentable Distinctions Between Claims 3 and 4 and the Cited References

Claim 3 of the present invention claims an aluminum sheet material for automobile manufactured by a specific method, using a

specific material. In particular, claim 3 of the present invention claims an aluminum sheet material for automobile that contains between more than 2.6 and 5 wt% of Si, 0.2 to 0.8 wt% of Mg, 0.2 to 1.5 wt% of Zn, 0.2 to 1.5 wt% of Cu, 0.2 to 1.5 wt% of Fe, between 0.05 and less than 0.6 wt% of Mn, and one or more members selected from the group of 0.01 to 0.2 wt% of Cr, 0.01 to 0.2 wt% of Ti, 0.01 to 0.2 wt% of Zr and 0.01 to 0.2 wt% of V, with the balance being aluminum and unavoidable impurities. In the manufacturing method of claim 3, the aluminum sheet material undergoes a cooling rate after annealing that is 3°C/sec or higher, with a percent reduction from the casting ingot to the final product being 98% or above. As a result, the aluminum sheet material of claim 3 is excellent in tension property, Charpy property and bending property.

The Examiner asserts that "JP '232 does teach that it is known in the art to form sheet products from ingot starting materials instead of direct casting rolling thin sheets", and that "it would have been obvious to one of ordinary skill in the art to use the alloy taught by JP '232 in an ingot reduction practice (as taught by JP '054)."

Applicants disagree. Applicants believe that the Examiner misunderstands the starting materials described in JP '232. The paragraph [0003] in JP '232, to which the Examiner refers, describes the conventional art and not the starting materials in

JP '232. The starting material in JP '232 is a direct casting rolled thin sheet.

In contrast to JP '232, the invention disclosed in JP '054 resides in an aluminum sheet material and a manufacturing method thereof, comprising using conventional large-sized ingots. The method disclosed comprises a homogenizing process step and a hot rolling process step. An alloy manufactured by using a large-sized ingot and an alloy manufactured by using a direct casting rolled thin sheet, (which will be referred to as a caster material hereinafter), are classified into different technological areas.

Because the starting materials used in JP '232 and JP '054 are different from each other, the effects on each of these starting materials by a given manufacturing process differ greatly. Even if one were to use the starting materials having the alloy composition described in JP '232 with the manufacturing method described in JP '054, it would be impossible for one to manufacture sheet materials having the same material properties using cast materials having an entirely different structure.

Moreover, because the invention disclosed in JP '232 does not reside in materials using large-sized ingots but in materials using caster materials, Applicants submit that there is no motivation for combining the inventions disclosed in JP '232 and JP '054.

The invention of JP '232 also resides in an "Al-Mg-Si-series alloy sheet having the maximum crystal grain diameter of the metal texture of 100 μm or less, and the maximum length of the continuous Mg_2Si compound in the surface layer of 50 μm or less; wherein the direct cast rolled sheet of aluminum alloy is cold-rolled; in which the alloy sheet contains as indispensable elements, 0.2 to 3.0% of Si, 0.2 to 3.0% of Mg, one or more members selected from the group consisting of Mn 0.01 to 0.5%, Cr 0.01 to 0.5% and Ti 0.001 to 0.5%, and 1.0% or less of Fe, with the balance being aluminum and unavoidable impurities". However, Applicants point out that the invention disclosed in JP '232 does not reside in an alloy composition itself, but rather resides in an aluminum alloy sheet, in which the alloy composition, the texture of the sheet material and the starting material are defined.

Specifically, in claim 1 of JP '232, the metal texture of the surface layer of the rolled sheet is restricted to have a maximum length of continuous Mg_2Si of 50 μm or less. If the precipitates are too coarse and large, the strength after baking and coating is not sufficient. This is described in lines 29 to 35 in the right column of page 4 of JP '232 (the Japanese document).

In contrast, the present invention discloses a starting material that is not a caster material, but rather a large-sized ingot. With large-sized ingots, the texture is uniform. Thus, extremely coarse and large Mg_2Si precipitates do not exist. Accordingly, in the instant invention, it is not necessary to set the restrictions which appear in JP '232 (*e.g.* the size).

From the above description, it should be apparent to one of ordinary skill in the art that the sheet material for automobiles of the present invention is entirely different from the sheet material disclosed in JP '232. JP '232 is not an invention of the alloy composition itself, but is rather an invention of a sheet material in which the texture is limited. Accordingly, one of ordinary skill in the art would immediately recognize that the product of the present invention and the invention disclosed in JP '232 are different.

In JP '054, there is no description that a large-sized ingot is used as the starting material. Further, in JP '054, the annealing temperature and the cooling conditions are described, but the material properties are determined by a complicated combination of many process control factors such as the alloy composition, ingot structure, homogenizing process condition, rolling reduction, annealing temperature and the cooling rate after annealing. Because these process factors can vary, even if some of these factors are known, the combination of all these

factors would not be obvious to those of ordinary skill in the art. For the above reasons, Applicants submit that claim 3 is patentable over the combination of JP '232 and JP '054. The rejection is inapposite. Withdrawal of the rejection is warranted and respectfully requested.

Applicants submit that because claim 4 is dependent on claim 3, and claim 3 has been shown to be patentable over the combination of JP '232 and JP '054, claim 4 is also patentable. Withdrawal of the rejection with respect to claim 4 is warranted and respectfully requested.

Patentable Distinctions Between Claims 10 and 11 and the Cited References

Regarding claims 10 and 11, the following comments are provided.

The Examiner "points out JP '232 shows TS, YS and elongations in Table 3 that fall within the presently claimed TS, YS and elongations for similar Al alloys." (Please see page 4, lines 15-16 of the outstanding Office Action). Applicants have added claims 10 and 11 to address this rejection. Claim 10 is limited to an aluminum T4 tempered sheet for automobile, which has the same composition as that claimed in claim 3, yet with a tensile strength of 260 to 303 MPa.

Accordingly, there is no overlap between the tensile strength as appears in claim 10 of the present invention and that in JP '232. Accordingly, Applicants submit that claim 10 is patentable over JP '232 and/or any of the other cited art. A further description of why there is no overlap appears directly below.

In the Examples in Table 3 of JP '232, each of the boxes represents the results of tensile strength tests that are shown in the sequence of T4, T6 and "Difference" from top to bottom in each box. A-G represent examples and H-N represent comparative examples in this table. The top row in each box represents "before heating", (T4), or leaving the example alone at room temperature after manufacture (aging). The middle row represents "after heating", that is, heating the example at 170°C for 60 minutes (See column 12, 6^{th} line from bottom in the Japanese version of JP '232). The last row represents "Increment", that is, the difference between the "before heating" and "after heating" values. On page 16 of this response, please find a Table that compares the T4 tempered materials of the present invention with those of JP '232 regarding the mechanical properties (T4).

In particular, this table compares the T4 tempered material strength of JP '232 (Table 3) and the tensile property value of T4 material of the present invention (please see Tables 9 and 10 in the instant written description). JP '232 discloses the tensile strength of T4 materials in Examples A to G using given

manufacturing methods. The Arabic numbers in the second row of Table 3 (*i.e.*, 1, 5, 20, and 60) indicate the number of days that the material is left alone. From these examples it can be seen that the tensile strength value falls between 229 and 243 MPa, the proof strength falls between the values of 107 and 127 MPa, and the elongation falls between the values of 27.2 and 34.5%. These values are reproduced in the Table on page 16 of the instant response. The alloy composition of the comparative examples H, I, J, K and N of JP '232 have similar compositions to the composition of the instant invention. However, these comparative examples have the following range of mechanical properties. The tensile strength of these examples falls between the values of 200 to 259 MPa, the proof strength falls between the values of 111 and 160 MPa, and the elongation percentage is from 13.4 and 31.7% (Please see No. 2 in the Table on page 16).

In JP '232, the range of mechanical properties shown by all of the materials of the Examples and the Comparative Examples is listed in the third row (No. 3) of the Table. That is, the tensile strength is from 200 to 259 MPa, the proof strength is from 107 to 160 MPa and the elongation is from 13.4 to 34.5%.

In the fourth row of the Table on page 16 of this reply, values for the mechanical properties of T4 of the alloy of the present invention are presented. The tensile strength is from 253

to 303 MPa, the proof strength is from 140 to 177 MPa and the elongation value is from 21.8 to 24.8%.

Except for J1 and J2 of the instant invention whose properties are reported in the specification in Table 9 and Table 10, respectively, the range of tensile strength for T4 material is 260 to 303 MPa, which is outside the range of 200 to 259 MPa for tensile strength of the examples reported in JP '232.

Not only is the tensile strength superior in the instant invention, but the material of the present invention excels in bendability, Charpy impact value, and spot weldability. There is no description in JP '232 on these values or any potential improvement of these properties that results from the alloy composition. Thus, for the above reasons, Applicants submit that claim 10 is patentable.

Claim 11 claims an aluminum T4 tempered sheet material for an automobile wherein the tensile strength is superior to that claimed in claim 10 (*i.e.*, a tensile strength range of 274 to 303 MPa is claimed). Thus, claim 11 claims a high-strength material that is higher than the material of JP '232 by 15 to 103 MPa. Accordingly, Applicants submit that this claim is also patentable. As argued above, not only does claim 11 disclose compositions that have greater tensile strength, they also possess excellent Charpy impact values and spot weldability. Please see No. 6 in the Table

below for the tensile strength, proof strength and elongation values for claim 11.

Comparison of the Mechanical Properties of T4 Material between the Present Invention and JP '232

No.	Material		Tensile strength (MPa)	Proof strength (MPa)	Elongation (%)
1	JP '232 - T4	A to G (examples of the invention)	229-243	107-127	27.2-34.5
2	JP '232 - T4	H to K, M (comparative examples)	200-259	111-160	13.4-31.7
3	JP '232 - T4	A to G, H to K, and M (examples and comparative examples)	200-259	107-160	13.4-34.5
4	This invention - T4	G1 to J1, G2 to J2	253-303	140-177	21.8-24.8
5	Invention of Claim 10	G1 to I1, G2 to I2	260-303	145-177	21.8-24.1
6	Invention of Claim 11	G1 to H1, G2 to H2	274-303	154-177	21.8-23.3

*In this connection, L and N in JP '232 are out of consideration, since L has a Si content of 0.05% and N has a Mg content of 0.15%. These values are outside the scope of the present invention.

Patentable Distinctions Between Claims 12-16 and the Cited References

The following comments pertain to claims 12-16. Claim 12 of the present invention claims an alloy composition wherein the Si content is from 3.1 wt% to 5.0 wt%. Attached to this response, please find a 37 CFR §1.132 declaration executed by Mr. Yoichiro Bekki, one of inventors of the instant invention, wherein it is shown that test results on X1 and X2 of Table 2 in the declaration by the inventor Mr. Yoichiro Bekki have unexpectedly superior properties.

Please note that JP '232 and Claim 12 of the present invention do not overlap in their alloy compositions. The invention of claim 12 has a large content of Si, so the composition not only fails to overlap, but the composition also has better electric resistance as well as excellent weldability. Likewise, claims 15 and 16 which depend from claim 12 have further limited Si contents.

Claim 13 claims an alloy composition wherein the Si content is from 3.52 wt% to 5.0 wt%. Applicants show in the declaration that the test results of Y1 and Y2, which contain this amount of Si, also show unexpectedly superior results of the present invention relative to JP '232. Please note that the Si range in claim 13 does not overlap with JP '232, nor does it overlap with any of the other cited references. JP '054 discloses an Si range of 2.3 to

3.5 wt%, JP '095 discloses an Si range of 0.8 to 3.5 wt% and Komatsubara '948 discloses an Si range of 1.25 to 2.5 wt%. Accordingly, Applicants believe that the instant invention is patentable over any of these cited references.

Claim 14 claims an Si content that is from 3.95 to 5.0 wt%. Support for 3.95 wt% can be found in the composition of material G in Table 8 in the specification. Claim 14, which claims a narrower range for Si than claim 13 also does not overlap any of the cited references. Withdrawal of the rejection with respect to claims 12-16 is warranted and respectfully requested.

Patentable Distinctions Between Claim 9 and the Cited References

Claim 9 claims a manufacturing method of a sheet material for automobiles containing between more than 2.6 to 5 wt% of Si, 0.2 to 0.8 wt% of Mg, 0.2 to 1.5 wt% of Zn, 0.2 to 1.5 wt% of Cu, 0.2 to 1.5 wt% of Fe, 0.05 to 0.6 wt% of Mn, and 0.01 to 0.2 wt% or more of one or two atoms of Cr, Ti, Zr and V, with the balance being aluminum and unavoidable impurities. Claim 9 claims a manufacturing process wherein the cooling rate after annealing is done at 3°C/sec or higher and the percentage reduction is 98% or higher. By limiting the trace alloy composition, the cooling rate and the percentage reduction after annealing to these predetermined ranges, it is possible to impart on the material a predetermined

level of tensile property, bendability, Charpy property and spot weldability.

Claim 9 of the present invention uses large-sized ingots in the manufacturing method. In contrast, as disclosed above, JP '232 uses caster material. The metallic structures differ greatly in thickness between the ingot structure of large-sized ingots and the ingot structure of caster materials. Accordingly, it is impossible to infer the manufacturing method of Claim 9 of the present invention from JP '232.

JP '054 cannot make up for the deficiencies in JP '232. This is because JP '232 differs not only in the casting structure from JP '054, but also in the manufacturing process. JP '054 fails to disclose a hot rolling process.

Because the caster material of JP '232 is thin, the Si grains become very fine during casting. Accordingly, one of ordinary skill in the art would recognize that it is not necessary to make the Si grains even finer by rolling. Thus, a great percentage reduction is not needed. In contrast, the instant invention as claimed in claim 9 has a big percentage reduction because a large-sized ingot is used. Accordingly, one of ordinary skill in the art would recognize that it is necessary to refine the coarse Si grains and set the percentage reduction at 98% or higher.

The percentage reduction in JP '054 also differs from the instant invention for the following reasons. JP '054 discloses an

aluminum sheet material, which is said to possess excellent strength, high tensile strength and excellent corrosion resistance, and on which solution treatment was conducted after hot rolling and cold rolling with an area percentage reduction of 50% or higher, after a homogenizing treatment. The specification of JP '054 describes that rolling is conducted at a percentage reduction of 80% (3 mm ⇒ 0.6 mm) for hot rolling. The percentage reduction is 75% (0.6 mm ⇒ 0.15 mm) for cold rolling. This means that the percentage reduction accumulated by hot rolling and cold rolling is 95%. In contrast, the present invention describes a material for an automobile, on which annealing is conducted after hot rolling and cold rolling at a percentage reduction of 98% or higher, after homogenizing treatment. Accordingly, the percentage reduction of JP '054 does not fall within the percentage reduction claimed in claim 9. Moreover, this means that if rolling is initiated with a sheet material that has a thickness of 100 mm, sheet materials with thicknesses of 5 mm and 1/2.5 of 2 mm are obtained. If the thicknesses of the finished sheets are made the same, there is a big difference industrially, by using an ingot 2.5 times thick before hot rolling.

The reason why the rolling rate of the instant invention is 98% or higher is to sufficiently refine the Si grains. Even with a rolling rate of 95%, one is unable to achieve the unexpectedly superior aluminum sheets of the instant invention. It is not

necessary to roll at a rolling reduction of 98% or higher in all the cases of alloy using a large-sized ingot. A percentage reduction of 98% or higher is needed only in those sheet materials that contain significant amounts of Si grains, as in the present invention. This is the biggest difference from JP '054.

In JP '054, in spite of sheets that contain 2.3 to 3.5 wt% of Si for the purpose of cold rolling, this cold rolling at 50% or higher is conducted to destroy the hot rolling structure. When this is done, it is impossible to obtain the desired Charpy impact property. The desired Charpy impact property is not obtained until the cold rolling reduction is 98% or higher, as is disclosed and claimed in claim 9 of the present invention.

As discussed briefly above, the reason that the accumulated percentage reduction of 98% or higher is used is to refine the Si grains. The percentage reduction at levels of those claimed in the present invention is not needed unless rolling a large-sized ingot (and in the process refining the Si grains). Further, the percentage reduction as claimed in the instant invention is only needed to obtain thin sheet materials when a large-sized ingot is the starting material as in the present invention. It is not needed simply for refining the crystal grains of the aluminum material as is disclosed in JP '054.

Applicants respectfully submit that because of these differences, any material that is manufactured by the method of the

instant invention and by a method wherein rolling is outside the percentage reduction range of the present invention but within the range of JP '054 will have mechanical properties (such as tensile strength) that are different. Thus, for this reason alone, Applicants submit that claim 9 is patentable over JP '054 with or without Komatsubara '948.

Applicants, with the following comments, show that there is a relationship between the ingot size and the percentage reduction.

The accumulated reduction value from a given ingot increases by calculation because the difference in thickness between that ingot and the finished sheet increases as the thickness of the ingot increases (*e.g.* in the case of slab rolling). But when one rolls an alloy that has comparatively high contents of Si, Mg or Cu (like in the alloy of the present invention), as the rolling reduction increases, the workability decreases. This leads to cracked edges or surface quality deterioration. Because of these problems, one is often dissuaded from using a rolling reduction as high as 98%, as is disclosed and claimed in the present invention.

However, in pure aluminum alloys that have few impurities in the alloy composition, the workability is good, so rolling can be conducted at a rolling reduction as high as 98%. However, the rolling reduction varies depending on the properties one desires to impart on the material composition and on the sheet material by the rolling conditions. Because of these possible variations,

Applicants submit that it would have been impossible to predict the unexpected superior properties that have been achieved in the instant invention by combining the composition of the alloy of the instant invention with the rolling reduction set at 98% or higher.

Applicants do acknowledge that annealing at 530°C is essentially equivalent to a solution heat treatment as described in the Specialty Handbook Aluminum and Aluminum Alloys, and the annealing itself using this process is publicly known. However, regarding the subsequent cooling rate, one of ordinary skill in the art would consider various setups. In the present invention, to obtain the mechanical properties desired in the material of the present invention, a cooling rate of 3°C/sec is specified. Applicants provided test data regarding this cooling rate with the response of April 21, 2003 and do not present the data again here.

JP '232 describes that solution treatment was conducted at a temperature range from 400°C to the melting temperature of the material and the cooling rate after solution treatment was set at 2°C/sec or higher. However, Applicants point out that JP '232 is an invention related to caster material, so the starting materials of the inventions are different. The manufacturing process of JP '232 consists of melting, casting, cold rolling, solution treatment, and cooling after solution treatment. This method is characterized by having no homogenizing treatment nor hot rolling process.

Accordingly, JP '232 is an invention that possesses a highly divergent material structure and manufacturing process. Thus, one cannot infer that this different material will impart a high strength quality sheet even if one were to combine the solution treatment conditions of JP '232 and the rolling conditions described in JP '054. Nor can one infer that the combination of these references will make an accumulated percentage reduction of 98% or higher. Thus, for these reasons, withdrawal of the rejection over claim 9 is warranted and respectfully requested.

Applicants submit that because claim 2 is dependent from claim 9, and claim 9 is patentable for the reasons discussed above, claim 2 is also patentable. Thus, withdrawal of the rejection with respect to claim 2 is warranted and respectfully requested.

With the above remarks and amendments, it is believed that the claims, as they now stand, define patentable subject matter such that passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact T. Benjamin Schroeder (Reg. No. 50,990) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Pursuant to the provisions of 37 C.F.R. §§ 1.17 and 1.136(a), Applicants respectfully petition for a three (3) month extension of time for filing a response in connection with the present application. The required fee of $950.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By _____
Marc S. Weiner, #32,181

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

MSW/TBS/mua
0234-0433P

Attachment(s): Declaration under CFR § 1.132